



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PA 19406-1415

May 13, 2011

Mr. Michael Pacilio  
Senior Vice President, Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO), Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

**SUBJECT: THREE MILE ISLAND STATION, UNIT 1 – NRC TEMPORARY INSTRUCTION  
2515/183 INSPECTION REPORT 05000289/2011009**

Dear Mr. Pacilio:

On April 29, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Three Mile Island Unit 1, using Temporary Instruction 2515/183, "Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event." The enclosed inspection report documents the inspection results which were discussed on April 29, 2011, with Mr. R. Libra, and other members of your staff.

The objective of this inspection was to promptly assess the capabilities of Three Mile Island to respond to extraordinary consequences similar to those that have recently occurred at the Japanese Fukushima Daiichi Nuclear Station. The results from this inspection, along with the results from this inspection performed at other operating commercial nuclear plants in the United States will be used to evaluate the United States nuclear industry's readiness to safely respond to similar events. These results will also help the NRC to determine if additional regulatory actions are warranted.

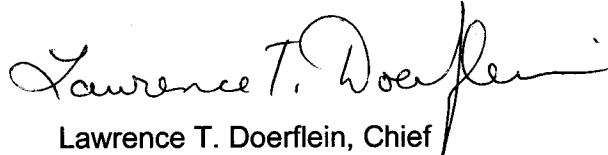
All of the potential issues and observations identified by this inspection are contained in this report. The NRC's Reactor Oversight Process will further evaluate any issues to determine if they are regulatory findings or violations. Any resulting findings or violations will be documented by the NRC in a separate report. You are not required to respond to this letter.

M. Pacilio

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Sincerely,

A handwritten signature in cursive script, reading "Lawrence T. Doerflein". The signature is written in dark ink and is positioned above the printed name and title.

Lawrence T. Doerflein, Chief  
Engineering Branch 2  
Division of Reactor Safety

Docket No.: 50-289  
License No.: DPR 50

Enclosure: Inspection Report No. 05000289/2011009

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M. Pacilio

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Sincerely,

*/RA/*

Lawrence T. Doerflein, Chief  
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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.: 50-289

License No.: DPR-50

Report No.: 05000289/2011009

Licensee: Exelon Generation Company

Facility: Three Mile Island Station, Unit 1

Location: Middletown, PA 17Q57

Dates: April 8 – April 29, 2011

Inspectors: David Kern, Senior Resident Inspector  
Justin Heinly, Resident Inspector

Approved by: Lawrence T. Doerflein, Chief  
Engineering Branch 2  
Division of Reactor Safety

## **SUMMARY OF FINDINGS**

IR 05000289/2011009; 04/08/2011 – 04/29/2011; Three Mile Island Station, Unit 1; Temporary Instruction 2515/183 - Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event.

This report covers an announced Temporary Instruction (TI) inspection. The inspection was conducted by two resident inspectors. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

## **INSPECTION SCOPE**

The intent of the TI is to provide a broad overview of the industry's preparedness for events that may exceed the current design basis for a plant. The focus of the TI was on (1) assessing the licensee's capability to mitigate consequences from large fires or explosions on site, (2) assessing the licensee's capability to mitigate station blackout (SBO) conditions, (3) assessing the licensee's capability to mitigate internal and external flooding events accounted for by the station's design, and (4) assessing the thoroughness of the licensee's walkdowns and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost during seismic events possible for the site. If necessary, a more specific followup inspection will be performed at a later date.

## **INSPECTION RESULTS**

All of the potential issues and observations identified by this inspection are contained in this report. The NRC's Reactor Oversight Process will further evaluate any issues to determine if they are regulatory findings or violations. Any resulting findings or violations will be documented by the NRC in a separate report.

03.01 Assess the licensee's capability to mitigate conditions that result from beyond design basis events, typically bounded by security threats, committed to as part of NRC Security Order Section B.5.b issued February 25, 2002, and severe accident management guidelines and as required by Title 10 of the Code of Federal Regulations (10 CFR) 50.54(hh). Use Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)," Section 02.03 and 03.03 as a guideline. If IP 71111.05T was recently performed at the facility the inspector should review the inspection results and findings to identify any other potential areas of inspection. Particular emphasis should be placed on strategies related to the spent fuel pool. The inspection should include, but not be limited to, an assessment of any licensee actions to:

| Licensee Action  | Describe what the licensee did to test or inspect equipment.   |
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| a. Verify through test or inspection that equipment is available and functional. Active equipment shall be tested and passive equipment shall be walked down and inspected. It is not expected that permanently installed equipment that is tested under an existing regulatory testing program be retested. | Licensee actions included the identification of equipment (active and passive) used for implementation of Extensive Damage Mitigation Guidelines (B.5.b) actions and any additional equipment used in Severe Accident Management Guidelines (SAMGs). The scope of the equipment was defined as that equipment specifically designated for B.5.b or SAMG mitigation (i.e., portable fire pump, special hoses, fittings, electrical jumper cables, specialized tools, radios, etc.). Permanent plant equipment (i.e., in situ equipment) was not retested, since it is normally in service, subjected to planned maintenance, periodically tested as required by an existing regulatory program, and/or checked on operator rounds. The licensee then identified surveillances/tests and performance frequencies for the identified equipment, and reviewed the results of recent tests. Active equipment within the scope defined above that did not have recent test results was tested. Passive equipment within the scope was walked down and inspected. |
|  | Describe inspector actions taken to confirm equipment readiness (e.g., observed a test, reviewed test results, discussed actions, reviewed records, etc.).   |

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| <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p> | <p>The inspectors reviewed prior inspection documents associated with NRC TI 2515/164, "Inspection of Nuclear Reactor Safeguards Interim Compensatory Measure – Section B.5.b Plant Mitigating Strategies to Address Loss of Large Areas of the Plant Due to Explosions or Fire;" NEI 06-12, "B.5.b Phase 2&amp;3 Submittal Guideline," Rev. 2; TMI-1 NRC Triennial Fire Protection Inspection Report 05000289/2011007; and procedures ER-TM-TSC-0010, "TMI-1 SAMGs," Rev. 2; ER-TM-TSC-0020, "Portable Electric Power Sources," Rev. 0; and ER-TM-TSC-0025, "TMI-1 Extensive Damage Mitigation Guidelines," Rev. 2, to verify active and passive equipment credited by licensee procedures to mitigate beyond design basis events were properly included in the scope of licensee review.</p>  |
|   | <p>The inspectors assessed the licensee's capabilities by conducting a review of the licensee's walkdown activities, interviewing station personnel, and verifying associated licensee-identified deficiencies were properly addressed in the corrective action program (CAP). The inspectors independently walked down and inspected major B.5.b contingency response equipment staged throughout the site. Emphasis was placed on strategies related to the spent fuel pool and to inject water to flood the reactor building containment.</p>  |
|   | <p>Discuss general results including corrective actions by licensee.</p>  |
|   | <p>The licensee has no equipment designated for use in the SAMGs that is not considered in situ plant equipment. All equipment (active and passive) designated for B.5.b was verified by the licensee to be in applicable procedures. All passive equipment was walked down and verified to be in place and ready for use. The licensee identified that a small portion (inflatable plugs) of the passive materials credited in the SFP leakage control strategy was not maintained at the onsite warehouse as described in the procedure (IR 1189429). The inspectors determined that there was sufficient additional mitigation equipment available and appropriate corrective action was initiated to address this issue.</p> <p>Passive equipment which had surveillance and/or preventive maintenance tasks had those activities performed to verify readiness for use. All active equipment located at the site was verified in place by the licensee. The licensee successfully tested the designated B.5.b fire pump (FS-P-15), which is a diesel fire pump mounted on a trailer.</p> |



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|  | Based on these reviews, the inspectors concluded that the required equipment is available and functional.   |
| Licensee Action  | Describe the licensee's actions to verify that procedures are in place and can be executed (e.g. walkdowns, demonstrations, tests, etc.)  |
| <p>b. Verify through walkdowns or demonstration that procedures to implement the strategies associated with B.5.b and 10 CFR 50.54(hh) are in place and are executable. Licensees may choose not to connect or operate permanently installed equipment during this verification.</p> <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p> | Licensee actions included the identification of those procedures used to mitigate the consequences of B.5.b related events and severe accidents. The licensee then compiled verification documentation for procedure validations. Licensee personnel walked down all applicable procedures to verify current revisions of each procedure were in their required locations, implementing control locations were accessible, each procedure could be executed, and associated labeling was correct.   |
|  | Describe inspector actions and the sample strategies reviewed. Assess whether procedures were in place and could be used as intended.   |
|  | The inspectors assessed the licensee's capabilities by conducting a review of the licensee's walkdown activities. The inspectors verified implementation procedures for each B.5.b mitigation strategy were established and issued for use. The inspectors reviewed ER-TM-TSC-0010, "TMI Severe Accident Management Guidelines," Rev. 2 and found their level of detail to be consistent with the current regulatory requirements. The inspectors discussed the reactor building vent SAMG with licensee emergency response organization (ERO) staff, who identified a viable vent pathway for which a procedure could be written and executed. In addition, the inspectors independently walked down six mitigation strategy procedures onsite. Emphasis was placed on procedures used to implement mitigation strategies for the spent fuel pool (SFP) and injecting water to flood the reactor building containment. |

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|   | <p>Discuss general results including corrective actions by licensee.</p> <p>The licensee reviewed the SAMG and B.5.b strategies and did not identify any issues that would prevent implementation of these strategies. Several minor deficiencies or enhancements were identified and documented in the CAP. The inspectors verified each issue was promptly corrected (e.g., current revision of B.5.b strategy procedures now available at the B.5.b fire pump trailer) or assigned an appropriate date for resolution in the corrective action program, commensurate with its safety significance. Specific issue reports (IRs) reviewed are listed in the Supplemental Information Attachment to this report.</p> <p>Based on the reviews conducted, the inspectors concluded that the procedures used to implement the strategies associated with B.5.b and 10 CFR 50.54(hh) were in place and were executable.</p> |
| <p>Licensee Action</p>  | <p>Describe the licensee's actions and conclusions regarding training and qualifications of operators and support staff.</p>   |
| <p>c. Verify the training and qualifications of operators and the support staff needed to implement the procedures and work instructions are current for activities related to Security Order Section B.5.b and severe accident management guidelines as required by 10 CFR 50.54 (hh).</p> | <p>Licensee actions included the identification of training/qualification requirements for operators and maintenance first line supervisors (FLS) for the implementation of actions needed to mitigate a B.5.b related event, and for the implementation of actions needed for the SAMGs. The licensee documented that operator and maintenance FLS personnel training requirements were current. In addition, the licensee identified the training/qualification requirements for applicable ERO command and support staff for the implementation of actions needed to mitigate a B.5.b related event, and for the implementation of actions needed for the SAMGs, and documented that ERO command and support staff training requirements were current.</p> <p>Describe inspector actions and the sample strategies reviewed to assess training and qualifications of operators and support staff.</p>                 |

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|  | <p>The inspectors assessed the licensee's training and qualification activities by conducting a review of training and qualification materials and records related to B.5.b and SAMG event response. Additionally, the inspectors reviewed a selection of operator classroom and control room simulator training lesson plans for B.5.b and SAMG event response.</p>  |
|  | <p>Discuss general results including corrective actions by licensee.</p>  |
|  | <p>The training requirements, qualifications, and associated records needed for operators for the implementation of SAMGs and B.5.b event response were reviewed by the licensee. Appropriate training requirements were embedded within the position qualifications for the shift managers, shift engineers, unit supervisors, and reactor operators. The licensee confirmed that all shift operators verify their qualifications prior to assuming a shift position. The training requirements, qualifications, and associated records needed for ERO command and support staff for the implementation of actions needed to mitigate a B.5.b event or implement the SAMGs were also reviewed. All ERO command and support staff training requirements were verified as current by the licensee.</p> <p>Based on the reviews conducted, the inspectors concluded that the training and qualifications of operators and the support staff needed to implement the procedures and work instructions are current for activities related to Security Order Section B.5.b and SAMGs as required by 10 CFR 50.54 (hh).</p> |

| Licensee Action   | Describe the licensee's actions and conclusions regarding applicable agreements and contracts are in place.  |
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| <p>d. Verify that any applicable agreements and contracts are in place and are capable of meeting the conditions needed to mitigate the consequences of these events.</p> <p>This review should be done for a reasonable sample of mitigating strategies/equipment.</p> | <p>The licensee reviewed TMI B.5.b event mitigation strategies (ER-TM-TSC-0025, OP-TM-AOP-009, and OP-TM-AOP-035) and the SAMG strategies (ER-TM-TSC-0010) to identify any necessary agreements and contracts to support implementation of the strategies. The licensee determined only one contract was necessary and verified purchase order 442035 was in place through 2011 for annual preventive maintenance on FS-P-15. Additionally, the licensee verified the reference list of available suppliers of portable electric generators was current.</p>   |
|   | <p>For a sample of mitigating strategies involving contracts or agreements with offsite entities, describe inspector actions to confirm agreements and contracts are in place and current (e.g., confirm that offsite fire assistance agreement is in place and current).</p>  |
|   | <p>The inspectors assessed the licensee's capabilities by conducting an independent review of the licensee's FS-P-15 maintenance contract. Additionally, the inspectors noted that several additional contracts, letters of agreement, or memoranda of understanding (MOU) had been established with offsite support providers. These MOUs were primarily for firefighting, ambulance, and medical services. The licensee did not consider these MOUs to be required to successfully implement their procedures for B.5.b and SAMG mitigation strategies. The inspectors determined the MOUs with offsite firefighting companies were necessary to support implementation of OP-TM-251-904, "SFP Building (External) Spray," Rev. 1. The inspectors verified this additional group of MOUs was documented in the TMI Radiological Emergency Plan Annex and that the MOUs were current, and assessed whether or not it was adequate for meeting the licensee's mitigation strategy.</p> |
|   | <p>Discuss general results including corrective actions by licensee.</p>   |

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|   | <p>The licensee reviews partially identified contracts, letters of agreement, and MOUs needed to implement B.5.b and SAMG mitigation strategies.</p> <p>The inspectors identified additional MOUs necessary to implement required strategies for the spent fuel pool. Since these MOUs were current, the failure of the licensee to assess them had no impact on their effectiveness.</p> <p>As a result of these reviews, the inspectors concluded that applicable agreements and contracts were in place and were capable of meeting the conditions needed to mitigate the consequences of these events.</p>   |
| Licensee Action   | <p>Document the corrective action report number and briefly summarize problems noted by the licensee that have significant potential to prevent the success of any existing mitigating strategy.</p>   |
| <p>e. Review any open corrective action documents to assess problems with mitigating strategy implementation identified by the licensee. Assess the impact of the problem on the mitigating capability and the remaining capability that is not impacted.</p> | <p>The following entries into the licensee's CAP were made in response to issues identified in section 03.01:</p> <p>IR 1189429, Inflatable plugs not available IAW ER-TM-TSC-002 Step 4.3.2;<br/> IR 1190193, ER-TM-TSC-0020 could not be found in the TMI-1 Control Room;<br/> IR 1192401, AOP-023 not located in simulator file cabinet;<br/> IR 1193762, Improve labeling of fuses for OP-TM-734-921/922 in CRS desk;<br/> IR 1196007, NOS ID: Inventory of B.5.b Equipment not performed;<br/> IR 1199363, Bldg 71 storage area for B.5.B pump, FS-P-15; and<br/> IR 1199718, Procedure review required for B.5.B pump FS-P-15</p> <p>The inspectors reviewed each IR for potential impact to the licensee's mitigation strategies. No significant impacts were identified.</p> |

03.02 Assess the licensee's capability to mitigate station blackout (SBO) conditions, as required by 10 CFR 50.63, "Loss of All Alternating Current Power," and station design, is functional and valid. Refer to TI 2515/120, "Inspection of Implementation of Station Blackout Rule Multi-Plant Action Item A-22" as a guideline. It is not intended that TI 2515/120 be completely reinspected. The inspection should include, but not be limited to, an assessment of any licensee actions to:

| Licensee Action  | Describe the licensee's actions to verify the adequacy of equipment needed to mitigate an SBO event.   |
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| a. Verify through walkdowns and inspection that all required materials are adequate and properly staged, tested, and maintained. | The licensee verified that equipment required to perform SBO mitigation actions has been identified in procedures, the location is tracked and periodically checked, and the shelf life limitations are understood. The licensee conducted walkdowns of the required equipment to ensure it was adequate and properly staged. Additionally, the licensee also conducted a review of open CAP items for potential SBO equipment impact.   |
|  | Describe inspector actions to verify equipment is available and useable.   |
|  | The inspectors assessed the licensee's capability to mitigate a SBO event by conducting a review of the licensee's walkdown activities. In addition, the inspectors selected a sample of equipment utilized/required for mitigation of a SBO event and conducted independent walkdowns to verify that the equipment was properly aligned, staged, tested and maintained. The sample of equipment selected by the inspectors included, but was not limited to, the SBO diesel generator (EG-Y-4), control building portable ventilation, and DC electrical fuses. |
|  | Discuss general results including corrective actions by licensee.  |

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|   | <p>The licensee's reviews verified that SBO equipment was ready to respond to a SBO event. The inspector's review of the recent SBO diesel quarterly runs, daily operator rounds data, and quarterly equipment inventories has identified no major issues. The inspector's independent walkdowns of SBO equipment identified no issues of concern. In addition, during their CAP review, the licensee did not identify any issues that would impact the SBO event mitigation strategy.</p>  |
| Licensee Action   | Describe the licensee's actions to verify the capability to mitigate an SBO event.  |
| b. Demonstrate through walkdowns that procedures for response to an SBO are executable. | <p>Licensee actions included the identification of procedures required to mitigate a SBO event, along with verification that the identified procedures were current. The licensee performed walkdowns to confirm that SBO mitigating procedures are executable and controlled copies of the procedures are located in their designated locations. Also, the licensee reviewed and validated that adequate operator training on SBO mitigation procedures is being performed. Additionally, the licensee conducted a review of open CAP items for potential impact to SBO event procedures.</p>  |
|   | Describe inspector actions to assess whether procedures were in place and could be used as intended.  |
|   | <p>The inspectors assessed the licensee's capabilities by conducting a review of the licensee's walkdown activity results. In addition, the inspectors selected a sample of SBO mitigation procedures to walkdown and independently verify the licensee's conclusions. Specifically, the inspectors verified the capability of operators to start the SBO diesel generator and supply power to a vital 4kV bus within the SBO event design basis response time. Also, the inspectors conducted field walkdowns to validate the feasibility of operators to perform manual manipulations of plant equipment directed by abnormal operating procedures for a SBO event.</p> |
|   | Discuss general results including corrective actions by licensee.   |

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|  | <p>The inspectors verified that the licensee's procedures used to respond to a SBO event were executable. Procedures adequately direct operators to start the SBO diesel generator and supply power to a site vital bus from the control room with permanently installed plant equipment. Additionally, the inspectors verified the licensee conducts adequate training for licensed and non-licensed operators on the performance of SBO procedures. Inspector walkdowns of the SBO event mitigating procedures identified no issues of concern.</p> |
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03.03 Assess the licensee's capability to mitigate internal and external flooding events required by station design. Refer to IP 71111.01, "Adverse Weather Protection," Section 02.04, "Evaluate Readiness to Cope with External Flooding" as a guideline. The inspection should include, but not be limited to, an assessment of any licensee actions to verify through walkdowns and inspections that all required materials and equipment are adequate and properly staged. These walkdowns and inspections shall include verification that accessible doors, barriers, and penetration seals are functional.

| Licensee Action  | Describe the licensee's actions to verify the capability to mitigate existing design basis flooding events.  |
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| a. Verify through walkdowns and inspection that all required materials are adequate and properly staged, tested, and maintained. | <p>Licensee actions included review of the TMI-1 Flood Protection Systems Design Basis Document and identification of equipment and penetration seals used/required for mitigation of internal and external flooding. This review addressed both the TMI-1 and TMI-2 flood barrier system and the Unit 1 severe flood mitigation system. The licensee then conducted walkdowns of this equipment to ensure it was adequate and properly staged. Doors, barriers, tools, and penetration seals that were used for mitigation of flooding were identified, and checked to see if they were routinely inspected to ensure functionality. Where routine inspections were not performed or could not be relied upon to ensure functionality, the licensee performed walkdowns and inspections to ensure that the components were functional. Additionally, detailed plant walkdown/inspections of all external flood barriers, seals, and penetrations were performed in late 2010, as corrective action to an external flood deficiency previously documented in NRC Inspection Report 05000289/2010005.</p> |



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|  | <p>Describe inspector actions to verify equipment is available and useable. Assess whether procedures were in place and could be used as intended.</p> <p>The inspectors assessed the licensee's capabilities to mitigate flooding by conducting a review of the licensee's walkdown activities. In several instances, these reviews involved the inspectors accompanying licensee engineering personnel during their in-field walkdowns. In addition, the inspectors conducted independent walkdowns of selected flood mitigation equipment to contribute to the overall assessment of the licensee's flood mitigating capabilities. Licensee flood mitigation procedures were reviewed and discussed with licensee staff to verify they could be used as intended. Selected periodic maintenance and inspection records were reviewed to verify flood protection barriers and equipment were properly maintained. The inspectors verified each flood-related issue was entered into the CAP and reviewed the initial assessment and assigned schedule for resolution.</p> <p>Discuss general results including corrective actions by licensee.</p> <p>The inspectors determined that, in general, all required materials are adequate and properly staged, tested, and maintained to respond to an internal flood or external flood within the plant's design bases. While this effort did not identify any operability or significant concerns, the licensee identified several minor deficiencies and enhancements associated with preventive maintenance or periodic testing for the severe flood mitigation pumps, a sewage line check valve, and turbine building flood detection. The licensee also identified that the assumed operator response time for a circulating water rupture in the turbine building was unrealistic. The licensee initiated appropriate IRs for further assessment and resolution of licensee and inspector identified issues, as listed in the Supplemental Information Attachment to this report. The inspectors reviewed the associated issue reports and determined the licensee's initial responses, including their assessment and prioritization, were appropriate. The inspectors noted the licensee was in the process of reanalyzing the Probable Maximum Flood (PMF) associated with plant's external flood design basis. Accordingly, the licensee established contingency actions to reassess station flood mitigation measures following completion of the PMF reanalysis.</p> |
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|  | <p>The licensee also identified several issues that appeared to be beyond the plant's design and licensing bases concerning potential seismically induced internal flooding associated with non-seismically qualified piping (fire service water, portions of feed water, and secondary river water) installed in rooms containing safety related mitigating equipment used for safe shutdown. The licensee intends to review the capability of the listed non-seismic systems to maintain their integrity during a safe shutdown earthquake. Based on an initial inspector review, these piping failures were not within the scope of the seismic safe shutdown path assumed in the licensee's response to NRC Generic Letter 87-02. The licensee initiated appropriate issue reports for further assessment and resolution of licensee and inspector identified issues, as listed in the Supplemental Information Attachment of this report.</p> |
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| <p>03.04 Assess the thoroughness of the licensee's walkdowns and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost during seismic events possible for the site. Assess the licensee's development of any new mitigating strategies for identified vulnerabilities (e.g., entered it in to the corrective action program and any immediate actions taken). As a minimum, the licensee should have performed walkdowns and inspections of important equipment (permanent and temporary) such as storage tanks, plant water intake structures, and fire and flood response equipment; and developed mitigating strategies to cope with the loss of that important function. Use IP 71111.21, "Component Design Basis Inspection," Appendix 3, "Component Walkdown Considerations," as a guideline to assess the thoroughness of the licensee's walkdowns and inspections.</p> |  |
| <p>Licensee Action</p>   | <p>Describe the licensee's actions to assess the potential impact of seismic events on the availability of equipment used in fire and flooding mitigation strategies.</p>  |
| <p>a. Verify through walkdowns that all required materials are adequate and properly staged, tested, and maintained.</p>   | <p>Licensee actions included the identification of equipment used for mitigation of fire and flood events. Station personnel walked down and inspected both permanent and temporary equipment, including storage of transient materials throughout the station. Engineering personnel determined if the equipment was seismically qualified, and where not seismically qualified performed preliminary assessments of adequacy based on piping construction. Station personnel also reviewed the most recent (2010) periodic maintenance rule program structural inspection records.</p> |

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|  | <p>Describe inspector actions to verify equipment is available and useable. Assess whether procedures were in place and could be used as intended.</p> <p>The inspectors conducted multiple walkdowns, both independently and in conjunction with licensee personnel, of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost or degraded during a seismic event. This equipment included, but was not limited to:</p> <ul style="list-style-type: none"> <li>• all major B.5.b contingency response equipment staged throughout the site;</li> <li>• fire protection and suppression equipment in portions of the turbine building, control building, auxiliary building, intermediate building, and emergency diesel generator buildings;</li> <li>• the installed diesel and electric fire pumps; and</li> <li>• numerous flood barriers and penetration seals.</li> </ul> <p>Licensee earthquake, flood, and fire mitigation procedures were reviewed to verify they could be used as written. The results of the inspectors' reviews aligned with the licensee's conclusions that there were a number of seismic vulnerabilities that potentially need to be addressed, as described below. The inspectors determined that the licensee meets the current licensing and design bases for B.5.b, fire protection, and flooding.</p> <p>Discuss general results including corrective actions by licensee. Briefly summarize any new mitigating strategies identified by the licensee as a result of their reviews.</p> |
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|  | <p>The inspectors noted the licensee meets the current licensing and design bases for B.5.b, fire protection, and flooding. The licensee identified a number of issues pertaining to potential fire system and flood protection vulnerabilities, and documented these issues in the CAP. See the Supplemental Information Attachment to this report for a listing of IRs initiated by the licensee.</p> <p>Seismically qualified is defined as those structures, systems, and components (SSCs) that have been formally qualified to function during and after a design basis earthquake. The licensee's reviews determined that non-safety related SSCs, in general, were not considered to be either seismically qualified or rugged. Further evaluation was initiated via the CAP (IR 1201621) to determine whether portions of the fire protection or flood mitigation systems could be classified as seismically rugged. Various building sump pumps and flood detectors were not designed as seismically qualified and have not been evaluated, to date, as being seismically rugged. The inspectors observed that fire protection piping is generally well supported for vertical loads with rod hangers and support spacing consistent with ANSI B31.1 recommendations. Rod hangers provide for stable support for horizontal loading. Lateral support is often provided at valve headers, hose stations, and areas of concentrated weight. Firefighting equipment staged to respond to B.5.b events was not stowed in seismically qualified buildings and locations, as a seismic event and B.5.b event were not assumed to occur coincidentally.</p> <p>The existing earthquake procedure, OP-TM-AOP-003, "Earthquake," was considered sufficient by the licensee. The licensee determined that fire or flood mitigation strategy enhancements would be considered following industry recommendations from other plants that have identified similar beyond-design-bases vulnerabilities.</p> |
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## Meetings

### 4OA6 Exit Meeting

The inspectors presented the inspection results to Mr. R. Libra, Plant Manager, and other members of licensee management at the conclusion of the inspection on April 29, 2011. Proprietary information reviewed by the inspectors during the inspection was returned to the licensee. The inspectors verified the inspection report does not contain proprietary information.

## SUPPLEMENTAL INFORMATION

### KEY POINTS OF CONTACT

#### Licensee

W. Carsky, Director, Engineering  
M. Fitzwater, Senior Regulatory Affairs Engineer  
P. Bennet, Manager, Mechanical Design Engineering  
H. Crawford, Manager, Reactor Engineering

#### Other

D. Dyckman, Nuclear Safety Specialist, Pennsylvania Department of Environmental Protection

### LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

#### **03.01 Assess the licensee's capability to mitigate conditions that result from beyond design basis events**

##### Procedures:

ER-TM-TSC-0010, TMI-1 Severe Accident Management Guidelines, Rev. 2  
ER-TM-TSC-0020, Portable Electrical Power Sources, Rev. 0  
ER-TM-TSC-0025, TMI-1 Extensive Damage Mitigation Guidelines, Rev. 2  
OP-TM-AOP-005, River Water Systems, Failures, Attachment 5, Rev. 9  
OP-TM-AOP-009, Loss of Spent Fuel Cooling, Rev. 4  
OP-TM-AOP-035, Loss of Spent Fuel Cooling, Rev. 2  
OP-TM-212-536, Transfer of BWST to Spent Fuel Pools, Rev. 0  
OP-TM-220-911, Flood the Reactor Building with Fire Service Water, Rev. 4  
OP-TM-251-901, High Capacity Fire Service Makeup to Spent Fuel Pool, Rev. 4  
OP-TM-251-902, Spent Fuel Pool Spray, Rev. 4  
OP-TM-251-904, Spent Fuel Pool Building (External) Spray, Rev. 1  
OP-TM-811-911, Fire Service Isolation to Maintain Yard Ring Header, Rev. 1  
OP-TM-811-912, Startup, Operation and Shutdown of FS-P-15 when Taking Suction from the River, Rev. 2  
TQ-AA-223-F070, Document Based Instruction Guide, Rev. 1

Drawings:

302-231, Fire Service Water, Sh. 1, Rev. 107  
302-231, Fire Service Water, Sh. 2, Rev. 16  
302-712, RB Spray, Rev. 49  
302-721, Hydrogen Purge Flow Diagram, Rev. 23  
302-831, Reactor, Auxiliary and Fuel Handling Buildings, Ventilation Flow Diagram, Rev. 56  
302-832, Reactor, Auxiliary and Fuel Handling Buildings, Ventilation Flow Diagram, Rev. 9

Issue Reports:

IR 1189429, Inflatable Plugs not Available per ER-TM-TSC-002 Step 4.3.2  
IR 1190193, ER-TM-TSC-0020 Could not be Found in the TMI-1 Control Room  
IR 1192401, AOP-023 not Located in Simulator File Cabinet  
IR 1193762, Improve Labeling of Fuses for OP-TM-734-921/922 in CRS Desk  
IR 1196007, NOS ID: Inventory of B.5.b Equipment not Performed  
IR 1199363, Building 71 Storage Area for B.5.b Pump, FS-P-15  
IR 1199718, Procedure Review Required for B.5.b Pump FS-P-15

Other:

Abnormal Operating Procedure Box Inventory  
Engineering Change Request TM-08-00886, Additional Hydraulic Evaluations Supporting B.5.b,  
Rev. 1  
Training Lesson Plan 11.2.01.433, Severe Accident Management, Rev. 2  
Work Order R2094638, AOP Box Inventory (Includes B.5.b)  
Work Order R2157119, AOP Box Inventory

**03.02 Assess the licensee's capability to mitigate station blackout (SBO) conditions**

Procedures:

OP-TM-226-901, Loss of All RCP Seal Cooling, Rev. 4  
OP-TM-732-901, Energize 1P 480V Bus Using ES Bus Cross Tie, Rev. 2  
OP-TM-732-902, Energize 1S 480V Bus Using ES Bus Cross Tie, Rev. 2  
OP-TM-734-921, Transfer DCA to DC Diesel, Rev. 0  
OP-TM-734-922, Transfer DCB to DC Diesel, Rev. 0  
OP-TM-864-901, SBO Diesel Generator (EG-Y-4) Operations, Rev. 9A  
OP-TM-AOP-020, Loss of Station Power, Rev. 13  
OP-TM-AOP-023, 'A' DC System Failure, Rev. 2  
OP-TM-AOP-024, 'B' DC System Failure, Rev. 2  
OP-TM-AOP-034, Loss of Control Building Cooling, Rev. 9  
OP-TM-EOP-001, Reactor Trip, Rev. 10  
TQ-TM-104-A20-S002, ILT Simulator – Abnormal Operations - Station Blackout Caused by  
Tornado/High Winds, Rev. 1  
TQ-TM-104-732, Initial Licensed Operator – Vital AC/DC Systems, Rev. 6  
TQ-TM-305-1001-F040, Partial Use Lesson Plan Cover Sheet, Rev. 1  
1107-9, SBO Diesel Generator, Enclosure 1, Rev. 64

Issue Reports:

IR 1020103, EED-B-3 SBO Battery Connectors Found Degraded Condition  
IR 1070343, Gasket Leaking on EG-Y-4 Ring Catcher  
IR 1071776, EG-V-84A Seat Degraded and Internals Extremely Dirty  
IR 1093770, EG-Y-4 Cylinder #3 Fuel Injector Leak  
IR 1190092, PCR: Portable Onsite Generator Not in Designated Storage Area  
IR 1193762, Improve Labeling of Fuses for OP-TM-734-921/922 in CRS Desk  
IR 1194610, Guard LSA on SBO DL Room Vent Fan AH-E-198  
IR 1197117, SBO 'B' Sump Pump did not Start  
IR 1198163, Spare Parts in SBO Battery Room  
IR 1198177, Loose Insulation on SBO DG Exhaust Stack  
IR 1204408, PCR: 1107-9 SBO Diesel Fuel Oil and Air Start  
IR 922219, DF-P-4B Starts at Lower Level in DF-T-7

Other:

Document No. 990-1879, Station Blackout Evaluation Report Addressing Power Uprate to  
2620 MW(t), Rev. 2  
Work Order R2172273, Fire Fighting Emergency Equipment Inventory

**03.03 Assess the licensee's capability to mitigate internal and external flooding events  
required by station design**

Procedures:

1104-49, Domestic Water, Rev. 54  
MA-TM-122-901, Install U1 Flood Barriers, Rev. 0  
MA-TM-122-902, Install U1 ISPH Flood Barriers, Rev. 0  
MA-TM-122-921, Set Up EG-Y-6 to Energize 1A ES MCC, Rev. 0  
MA-TM-122-924, Set Up FP-P-2A/B to Supply Feedwater to OTSG A and B, Rev. 0  
MA-TM-122-927, Set Up FP-P-1 and FP-P-3 for RCS Makeup from SF Pool, Rev. 0  
MA-TM-122-951, Install U2 Flood Barriers, Rev. 0  
OP-TM-108-111-1001, TMI Site Inaccessibility Plan, Rev. 4  
OP-TM-122-901, Inflate Aux and FHB Door Seals, Rev. 0  
OP-TM-122-922, Energize 1A ES MCC Using EG-Y-6, Rev. 0  
OP-TM-122-925, Maintain OTSG A and B Level Using FP-P-2A/B, Rev. 0  
OP-TM-122-928, RCS Inventory and Pressure Control Using SFMS, Rev. 0  
OP-TM-122-951, Unit 2 Flood Protection Actions, Rev. 0  
OP-TM-211-241, Shutdown IST of Letdown Isolation Valves, Rev. 3  
OP-TM-AOP-002, Flood, Rev. 3  
OP-TM-EOP-010, Emergency Procedure Rules, Guides and Graphs, Rev. 11  
OP-TM-LWDS-0101, LWDS 1-1 System 232, Rev. 1  
OP-TM-LWDS-0205, LWDS 2-5 System 232, Rev. 0  
OP-TM-LWDS-0206, LWDS 2-6 System 232, Rev. 0  
OP-TM-LWDS-0207, LWDS 2-7 System 232, Rev. 0  
OP-TM-MAP-N0207, Map N-2-7 System 424, Rev. 0  
OP-TM-MAP-N0208, Map N-2-8 System 424, Rev. 0



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OP-TM-PLB-0405, PLB-4-5 System 212, Rev. 3  
OP-TM-PLB-0505, PLB-5-5 System 212, Rev. 3  
PLA-1-1, Panel Left Annunciator A, Rev. 11  
PLA-1-2, Panel Left Annunciator A, Rev. 11  
PLA-1-3, Panel Left Annunciator A, Rev. 12  
PLA-4-9, Panel Left Annunciator A, Rev. 10  
PLA-8-9, Panel Left Annunciator A, Rev. 9  
PLB-8-3, Panel Left Annunciator B, Rev. 7  
PRF1-3-5, Panel Right Front (New) (PRF1), Rev. 7

#### Completed Tests:

OP-TM-211-241, Shutdown IST of Letdown Isolation Valves, 12/17/09  
OP-TM-212-217, DH-V-6A and Associated Tests, 11/16/09  
OP-TM-212-218, DH-V-6B and Associated Tests, 11/16/09  
OP-TM-212-242, Shutdown IST of DH-V-4A and DH-V-4B, 1/10/10  
OP-TM-424-313, IST of CO-V-14S and CO-V-111S, 2/9/11

#### Drawings:

1E-122-01-1000, TMI Flood Barrier System Plot Plan, Rev. 0  
1E-122-01-1001, TMI Flood Barrier System Diesel Generator Building Details, Rev. 0  
1E-122-01-1002, TMI Flood Barrier System Control Building Details, Rev. 0  
1E-122-01-1003, TMI Flood Barrier System Intermediate Building Details, Rev. 0  
1E-122-01-1004, TMI Flood Barrier System Fuel Handling Building Details, Rev. 0  
1E-122-01-1005, TMI Flood Barrier System Auxiliary Building Details, Rev. 0  
1E-122-01-1006, TMI Flood Barrier System Heat Exchanger Vault Details, Rev. 0  
1E-122-01-1007, TMI Flood Barrier System Air Intake Tunnel Details, Rev. 0  
1E-122-01-1008, TMI Flood Barrier System Tendon Access Gallery and Alligator Pit Details,  
Rev. 0

#### Issue Reports:

IR 1198202, Inadequate Evaluation of CW Pipe Failure in TB  
IR 1198507, PCR Potential Failure of DO Piping in EGD Building  
IR 1200156, Testing of Severe Flood Mitigation Pumps  
IR 1200162, PCR Mitigation of SR Pipe Failure in HEV

#### Other:

Maintenance Rule Structures In-Scope Inspection Report for Dike and Flood Control Device,  
Rev. 1  
SDBD-T1-122, System Design Basis Document for Flood Protection Systems, Rev. 0  
Work Order 1834333, Miscellaneous Sumps Level Instrument PM  
Work Order R2144761, Flood Preparedness Check – Flood Panels  
Work Order R2160573, Flood Preparedness Check, Aux/FH Door Seals  
Work Order R2135976, PM009007 EG-Y-6: Vendor Work  
Response to IER L1 11-1 Recommendation 3, Enclosure 3

Attachment

**03.04 Assess the thoroughness of the licensee's walkdowns and inspections of important equipment needed to mitigate fire and flood events to identify the potential that the equipment's function could be lost during seismic events**

Procedures:

1104-45B, Fire Service Water System, Rev. 99  
1104-45C, Fire Service Sprinkler System, Rev. 24  
1104-45D, Fire Service Deluge System, Rev. 22A  
1104-45E, Fire Service Preaction System, Rev. 13  
1104-45F, CO<sub>2</sub> Fire Extinguishing for Relay Room, Rev. 26  
1104-45M, Operation Support Facility Computer Halon System, Rev. 7  
1104-45Q, TMI Outbuilding Fire Protection Systems, Rev. 18

Issue Reports:

IR 1193996, Seismic Tie-down EE-BK-220 Behind 1D 4kV ES Switchgear  
IR 1200158, Evaluate Seismic Event Potential for FWLB in IB  
IR 1200165, Erroneous Seismic Class on 302 Drawings  
IR 1201333, Some Plant Locations Inaccessible for NER Walk-down  
IR 1201424, Potential FS Piping Failures in Class 1 Buildings  
IR 1202522, Inaccessible Walk-down Not in Forced Outage

Other:

EPRI Experience Based Seismic Verification Guidelines for Piping Systems, Volume I – Seismic Review Procedure, June 2005  
Pre-Fire Plan #27, FH-FZ-5, Fuel Handling Bldg. Control Bldg. Patio Area, Rev. 1  
Pre-Fire Plan #28, CB-FA-3A, Control Bldg. 1D Switchgear Room, Rev. 1  
Pre-Fire Plan #32, FH-FZ-5, Fuel Handling Bldg. Control Bldg. Patio Area, Rev. 1  
Pre-Fire Plan #33, CB-FA-4A, Control Bldg. Except Control Room, Rev. 2  
Pre-Fire Plan #34, CB-FA-4B, Control Bldg. Control Room, Rev. 2  
Pre-Fire Plan #35, FH-FZ-5, CB Patio Area (FH-FZ-5-355/365' I&C Shop/Office Area), Rev. 2  
Pre-Fire Plan #38, FH-FZ-5, Fuel Handling Bldg. Control Bldg. Patio Area, Rev. 1

**LIST OF ACRONYMS USED**

|       |   |
|-------|---|
| ADAMS | Agencywide Documents Access and Management System |
| CAP   | Corrective Action Program                         |
| CFR   | Code of Federal Regulations                       |
| ERO   | Emergency Response Organization                   |
| FLS   | First Line Supervisor                             |
| MOU   | Memorandum of Understanding                       |
| NRC   | Nuclear Regulatory Commission                     |
| PMF   | Probable Maximum Flood                            |
| SAMG  | Severe Accident Management Guideline              |
| SBO   | Station Blackout                                  |
| SFP   | Spent Fuel Pool                                   |